C. LANDSCAPE ELEMENTS

Introduction

Landscape elements are the site amenities and furnishings that create livable exterior spaces. Landscape elements bring visual continuity to the diverse sites and projects throughout the Laboratory. Well designed landscape elements improve the image and function of the Laboratory work environment.

Landscape Elements include:

- Site Furnishings
- Signage
- Barriers
- Exterior Lighting
- Pavement
- Planting

Principles

The principles for landscape elements are:

- Landscape elements should create an attractive, human-scale environment for visitors and staff.
- Landscape elements should be selected based on the rural or urban development character of the project site.
- Standards for landscape elements such as site furnishings, paving, lighting, plant materials and signage should be established and included in new developments.
- Landscape elements should be selected for durability, maintainability and appearance They should incorporate recycled and "green" material standards.
- Landscape design should enhance the natural landscape and promote the use of native, drought-tolerant and low-maintenance plant materials.
- Landscape plantings should encourage water harvesting and include water conserving practices and techniques.
- Landscape elements should support security needs with new innovative landscape designs and techniques.

References

Other Laboratory and industry documents to be used as references are:

ESM
LANL Engineering Standards Manual, LIR 220-03-01

IESNA
Illumination Engineering Society of North America, Lighting Handbook: Ninth Edition, 2000

NMNSPA
New Mexico Night Sky Protection Act, {74-12-1 to 74-12-10 NMSA 1978}, 1999

SSSP
Site Safeguards and Security Plan

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1. Site Furniture

Comfortable, attractive and coordinated site furnishings are crucial to making outdoor spaces functional and attractive. This section describes requirements for site furniture and provides pre-approved manufactures.

This section provides supplemental information for:

Table XXX, C.1 Landscape Element/ Site Furniture

- **Benches**
- **Picnic Tables**
- **Trash Receptacles**
- **Cigarette**
- **Bicycle Racks**
- **Transit Shelters**

Site Furnishings Standards

Site furnishings provide the simple comforts of a place to sit, eat or relax for a few moments for Laboratory staff and visitors. To provide this needed amenity at Los Alamos National Laboratory, site furnishings are needed in hundreds of disperse locations across this vast site. Standardization of site furnishings is necessary to make maintenance efficient and simplify repair and replacement activities.

A two levels of furnishing standards have been set. One for furnishing in "centers" and a second for those in "edge" locations. 'Centers" and "edges" are locations shown on *Map XXX* in Section_____.

To advance the use of sustainable materials, the furnishing selections have been made base on recycled material content. Any substitutions should have at least as high or higher recycled content than the standard

An equally important function of standardization is to assure that site furnishings are durable, consistent in quality, and support the corporate image of the Laboratory. The standards shall be the minimum quality for each site furnishing. The style of any substitute should be similar to the standard.

Approval of substitutions

The site furnishings standard have been selected to begin that standardization. Although substitutions may be accepted, the benefit of increased maintenance efficiency and simplification is greatly reduced by deviations from the standard.

Determination of approved substitutions will be made by _____.

a. Benches

- Locate benches on walk edge farthest from the street in shaded locations (when possible).
- Set benches at bus stops a minimum of 4 ft. from the face of the curb.
- On walkways 6 ft. or less in width, provide an adjacent pad for bench placement.

IFigure XXX:: Standard Bench - Center Zone

Figure XXX:: Standard Bench - Edge Zone

Standard Bench/Center Zone:

Petoskey Bench
62" Backed with Armrests
Powder Coated: color Silver
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Steel, minimum 90% recycled content
- Silver color - powder coat
- Back rest style with armrests
- Minimum 5' Length

Standard Bench/Edge Zone:

Balustrade Bench
72" Backed
PolySite Seat
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Recycled Plastic, minimum 95% recycled content
- Grey color plastic members. Black metal members, powder coated.
- Bench style with back rest
- Minimum 5' Length

b. Picnic Tables

- Provide handicapped access to at least one side of table.
- Install tables on paved level pads with paved access to pad.

Figure XXX:: Standard Table - Center Zone

Figure XXX:: Standard Table - Edge Zone

Standard Picnic Table/Center Zone:

Carousel Table
Cantena Stainless Steel Table Top
Backed Metal Grid Seats
Powder Coated: Silver Color
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Steel, minimum 90% recycled content
- Silver color, powder coated
- Handicap accessible on at least one side

Standard Picnic Table/Edge Zone:

Gretchen Table
PolySite Seat: Grey color
Metal Powder Coated: Black color
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Recycled Plastic, minimum 95% recycled content
- Plastic: grey color,
- Metal: black color, powder coated
- Handicap accessible on at least one side

c. Trash Receptacles

- Locate receptacles near key activity nodes where people gather or traverse.
- Place receptacles on paved surfaces with easy access for trash collection.
- Place trash receptacles a minimum of 6 ft. from benches or seating areas.
- Secure trash receptacles to the ground.

IFigure XXX: Standard Center Trash Receptacle

IFigure XXX: Standard Edge Trash Receptacle

Standard Trash Receptacle/Center Zone:

Petoskey 30 Gallon Litter Receptacle
Powder Coated: Silver color
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Metal, minimum 86% recycled content
- Silver color, powder coated
- Minimum 30 gallon capacity

Standard Trash Receptacle:/Edge Zone

Gretchen 30 Gallon Litter Receptacle
PolySite, color grey
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Recycled Plastic, minimum 83% recycled content
- Plastic: grey color
- Metal: black color, powder coated
- Minimum 30 callon capacity

d. Cigarette Receptacles

- Locate receptacles near key activity nodes where people gather or traverse.
- Place receptacles on paved surfaces with easy access for trash collection.
- Place trash receptacles within a minimum of 6 ft. from benches and seating areas.
- Pemanently secure receptacles to the ground or wall.

Standard Cigarette Receptacle:

Butler Ash Receptacle
Pole or Wall Mount
Clear Anodized Aluminum Cylinder, Silver Caps
Forms+Surfaces
6395 Cindy Lane Carpinteria, CA 93013
Phone: (800) 451-0410, Fax (805) 684-8620
www.forms-surfaces.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Metal, minimum 95% recycled content
- Silver color, powder coat
- Pole mount or wall mount style

e. Bicycle Racks

- Provide a minimum clearance of 15 ft. between bicycle racks and security barriers or buildings.
- Place racks on paved surfaces and in well-lighted areas.
- Allow a 2 ft. wide by 5 ft. long space for each parked bicycle.

Standard Bicycle Rack:

Flo Bike Rack
Stainless Steel
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

If the pre-approved manufacturer is not used, an equal alternate must be:

- Stainless Steel, minimum 65% recycled content
- Silver color, powder coat
- Minimum three (3) bicycle capacity

Figure XXX:: Standard Cigarette Receptacle

Figure XXX:: Standard Bike Rack

f. Transit Shelters

- Modular shelters shall be fabricated according to project needs and scale. Shelters will range from transit stops, to entry guard stations, and trail shelters.
- Modular shelters shall be designed according to the concepts demonstrated in *Figure XXX and XXX* . They shall be constructed using:
  - arched metal roofs, silver-colored
  - metal support structures, powder coated, silver-colored
  - transparent or opaque side panels, use non-discoloring materials
- Place shelters on paved surfaces.
- Allow a minimum clearance of 6 ft. between transit shelter edge and the face of the curb for pedestrian safety.
- Provide the following required improvements for different types of transit stops. The quantity of each shall be determined by _____.

Regional Transfer Station
- Emergency phone/panic pole
- Night lighting
- Benches
- Trash receptacles
- Bicycle racks

Transit Stop
- One each bench, trash receptacle, bike rack

Shuttle-Handicap Drop-Off
- Same as Transit Stop

Figure XXX: Example Transit Shelter

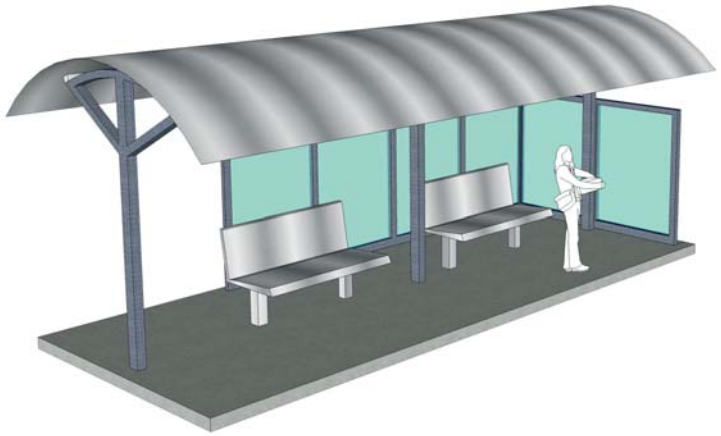
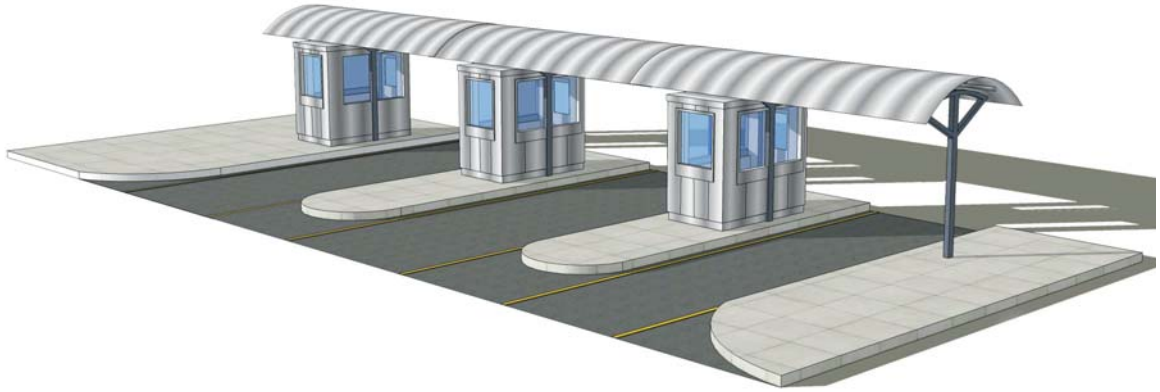


Figure XXX:: Example Transit Shelte as part of Entry Guard Station



2. Signage

A unified signage system works to provide clear directions and a unifying image for employees and visitors alike. Four signage categories are described in this section.

This section provides supplementarl information for:

Table XXX, C.2 Landscape Element / Signage

- **Identification Sign**
- **Directional**
- **Regulatory**
- **Interpetive**

The importance of signage standardization was emphasized during the Cerro Grande Wildfire that threatened Los Alamos National Laboratory in 2000. The need for a consistent, clear, easily read system of signs to aid in finding and identifying sites and buildings was one of the lessons learned from that event.

The following pages describes the Laboratory approved signage system to become that unifying system. There are four main signage categories with subsets within them.

Identification Signage
- Entry monumentation
- Planning Area
- Facility and Tech Area
- Building, Operation and Division
  - Freestanding
  - Wall mounted

Directional Signage
- Major Roadway
- Interior Roadway

Regulatory Signage
- Traffic Control
- Safety and Security

Interpertive Signage
- Pedestrian / Trail / Bicycle
- Visitor
- Public Transit

Detailed signage fabrication and installation instructions are available from _____.

Requests for signage determination for projects is available from_____.

Signage Principles:

The underlying principles that guide signage at the Laboratory are:

- Create a unique identity by incorporating a Laboratory logo and standardized graphics into all orientation, identification, and directional signage
- Express a world-class research environment.
- Organize signage to reduce visual clutter and improve legibility.
- Promote safety and security through clear and legible information delivery.
- Replace old signs with new signs in accordance with current standards.
- Follow DOE, county, state, and Laboratory standards.

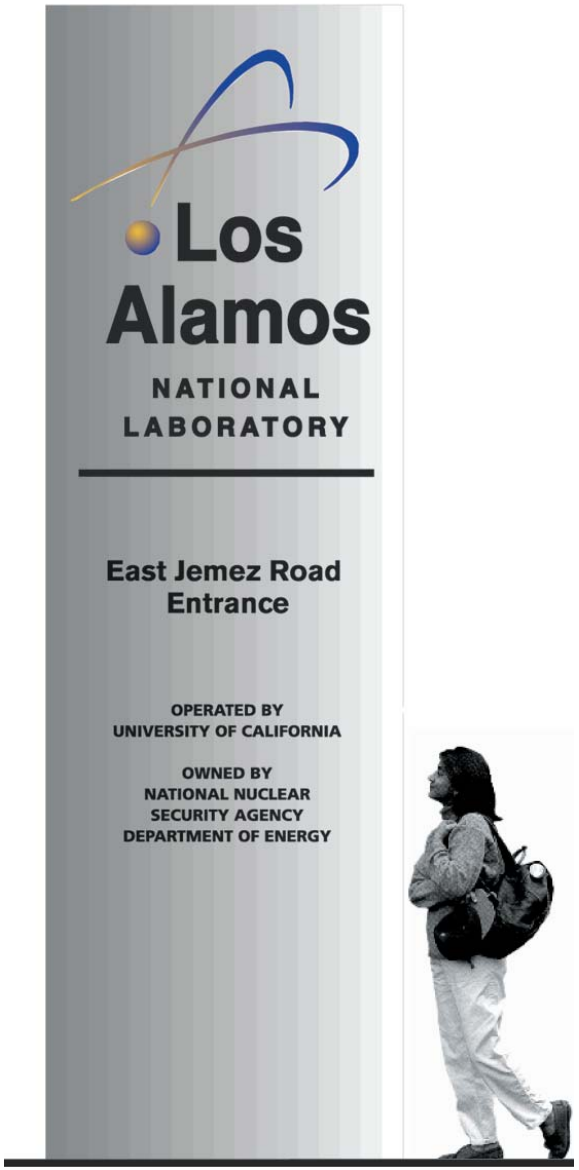
a. Identification Signage

There are five distinct types of identification signs. These consist of various sizes depending on the size of the area identified.

Laboratory Entry Identification

Locate distinct entry monument identification signage at major entrances to the site. The entry monument identification signage conveys a sense of place and importance. Primary entry identification, see Image IV-19, shall be located at the points identified in Figure IV-68. Secondary entry identification, see Image IV-20, shall be located at the points identified in Figure IV-68.

Figure XXX:: Entry Monumentation - Primary



IFigure XXX:: Entry Monument Locations Map

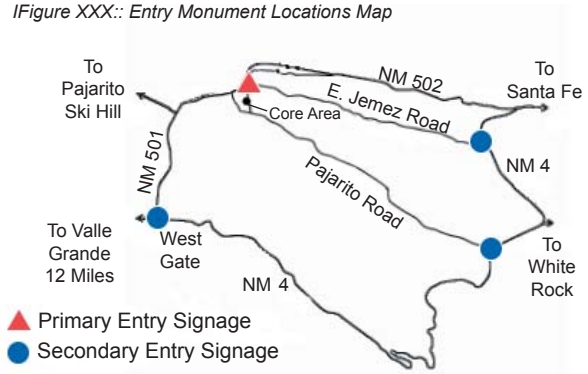
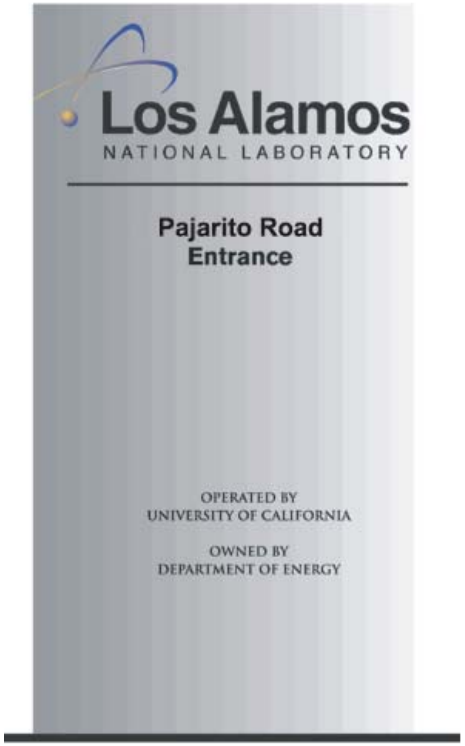


Image IV-20: Entry Monumentation - Secondary



Planning Area Identification

The second signage category identifies planning areas at the Laboratory (listed below). Each area sign shall communicate the type and amount of information demonstrated in *Figure XXX*.

- Core Area
- Pajarito Corridor East
- Pajarito Corridor West
- Anchor Ranch
- LANSCE Mesa
- Omega West
- Sigma Mesa
- Dynamic Testing

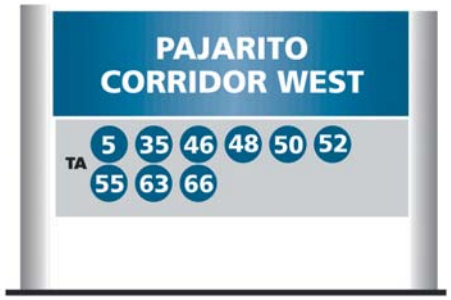
Facility and Tech Area Identification

Identification signage for a major facility or tech area within a planning area is the next level of signage. Major facility signs are illustrated in *Figure XXX*. Tech Area signs follow the format of *Figure XXX*.

Building (Structure), Operation and Division Identification

Building, operation and division identification signs can be freestanding *(Figure XXX)* or building mounted *(Figure XXX and XXX)*.

Figure XXX:: Planning Area Identification (typical)



IFigure XXX:: Facility Identification (typical)

Figure XXX:: Technical Area and Division Identification

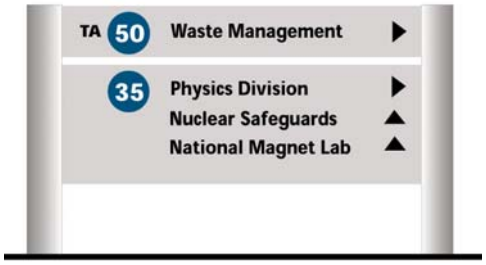


Figure XXX:: Building Identification - Freestanding

Figure XXX: Building Identification - Mounted

Figure XXX: Building Identification - Mounted

b. Directional Signage

Directional signage has two categories that correspond to use on specific roadways.

Major Roadway Directional
Directional signs for use on major arterials (Image IV-27) shall include directions to:
- planning areas
- tech areas

Interior Roadway Directional
Directional signs on interior roadways (Image IV-28) shall give directions to:
- tech areas
- divisions
- operations
- buildings

Figure XXX:: Major Roadway Directional

Figure XXX:: Interior Roadway Directional

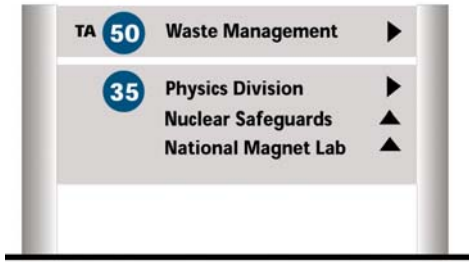
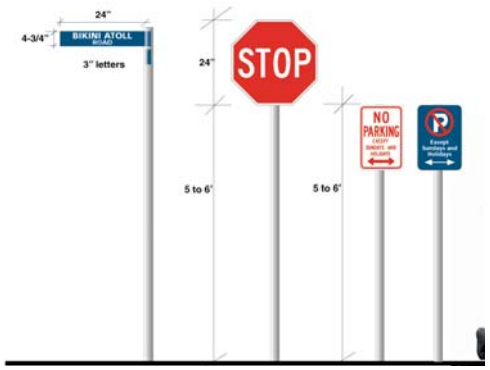


Figure XXX: Traffic Control



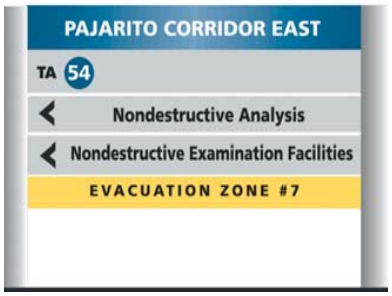
c. Regulatory Signage

There are two categories of regulatory signs that should be tailored to specific needs.

Traffic Control
Regulatory signage *(Image IV-29)* shall communicate traffic control information, including:
- roadway (stop signs, speed limit)
- parking
- street identification

Safety and Security
Safety and security signage (Image IV-30) shall be used:
- site-wide
- in specific areas
- at building entries

Figure XXX: Vehicular Safety and Security



d. Interpretive / Wayfinding Signage

This category of signage gives directional and interpretive information for pedestrians, visitors and public transportation patrons.

Pedestrian / Trail / Bicycle
Interpretive signage for pedestrians and bicyclist shall include:
- trail markers
- directionals

Visitor
Visitor signage shall include:
- welcome information
- directionals (parking and destination routes)
- interpretive pull-offs (for historical or explanatory information at a site or building) *(Image IV-31)*

Public Transit
Interpretive signage for public transit shall include:
- bus marker routes *(Image IV-32)*
- bus schedules and information

Figure XXX: Interpretive Signage

Figure XXX: Transit and Pedestrian Signage

SIGNAGE

3. Barriers

Gates and barriers are another landscape element with a substantial impact on Laboratory safety, security and appearance. This section describes the various types of barriers and where they are appropriate.

This section provides supplemental information for:

Table XXX, C.3 Landscape Element/Barriers

- **Gate Houses**
- **Fences and Gates**
- **Bollards**
- **Walls**
- **Jersey Barriers**
- **Landforms**

Security is an important function at the Laboratory. Properly designed security features can be effective, attractive and contribute to the visual appearance of the institution.

The Design Principles encourage designs to meeting security needs while improving the image of the Laboratory.

Security elements include:
- barriers
- gates
- fences
- walls
- bollards and jersey barriers
- buffer zones and landforms

There are four classifications of barriers used at the Laboratory:

Limited Access - Barriers that limit access to secure or classified areas or sites.

Assets Protection - Barriers that protect assets or sites from unauthorized access.

Visual Screen - Barriers that visually screen unattractive areas from general view.

Safety/Hazardous - Barriers that protect personnel from safety hazards.

Barriers must meet the required security level and should incorporate the design guidelines of the particular landscape development zone. See Table IV-4 for recommended barrier materials.

Security Elements Guidelines

- Integrate barrier design with architectural style, colors and materials.
- Incorporate drainage and erosion control measures into the design of security fences and structures.
- Design and locate barriers for ease of maintenance.
- Barriers used to limit access and protect assets shall have a 20 ft.. clear zone inside the barrier to facilitate visual supervision.
- Intrusion detection systems (IDS) should be integrated into the design of the barrier and access control systems. The selection of the particular IDS is determined by S-Division. Special design considerations for exterior IDS systems may include: topography, vegetation, wildlife, weather, soil conditions and background noise.

Unacceptable barrier materials in any zone are:
- **wood or recycled wood**
- **metal, plastic, or wooden slats in chain link fencing**
- **plastic materials**

a. Gate Houses

Careful attention to appearance and the gate house's relationship to surrounding buildings can result in a distinguished and attractive entrance. Images IV-14, IV-15 and IV-16 are examples of well designed gates. Gate designs must comply with security requirements set by Security Division. Contact S-1 for guidance.

- Entrances and exits from secure areas and buildings shall be the minimum number required to meet operational requirements and safety concerns.
- Gates should permit visibility beyond the secure boundary.
- All gates are to be of steel manufacture.
- Gates used for visual screening such as trash and storage enclosures are to be constructed to be a minimum 33% opaque.
- Guardhouses should be designed to avoid fencing in front of or behind the guardhouse. Fencing should direct pedestrians to the guardhouse area or secured entry point.
- Gates may be designated to allow fire and emergency services access. The minimum gate width for fire and emergency access is 12 ft.

Figure XXX: Gatehouse Design Quality

Figure XXX: Pedestrian Turnstile

Figure XXX: Vehicular Gate

b. Fences and Gates

Fences and gates are part of the barrier systems of the Laboratory and can make a positive visual impact while meeting the security needs of a project. Fence designs must comply with requirements set by Security Division. Contact S-1 for guidance.

Guidelines

- Fence design should compliment the physical appearance of adjacent buildings and gate houses.
- The fencing layout should be planned as an integral part of the site and building plans.
- New project construction should begin with removal of existing fencing that is no longer required. Renovation of substandard obsolete fencing should be included with each construction project.
- Open fencing can provide visual screening when covered with dense vines or with tightly spaced bars or rails. Fences used for visual screening should be 33% opaque.

1. Steel Fences and Gates

Steel fences and gates shall be used to limit access to secure or classified areas and to protect people from safety hazards.

Standard Steel Fence and Gate:

Stadium or Metro Steel Fence & Gate
Color: Black or Silver
Ametco Manufacturing Corporation
4326 Hamann Parkway, P.O. Box 1210
Willoughby, OH 44096
Phone: 1-800-321-7042, Fax: 1-440-951-2542

Impasse High Security Steel Fence & Gate
Ameristar Fence Products
1555 North Mingo
Tulsa, OK 74116
Toll Free Phone: 1-800-321-8724
Tulsa Phone: 918-835-0898
Toll Free Fax: 1-877-926-3747

Design specifications and fence heights shall be determined by security needs at an individual project level. In general, the Stadium Design is an attractive perimeter fence while the Metro Design acts as a security fence. Black or silver can be specified according to design intent.

In some cases, a much higher level of security is needed. For these instances, the Impasse High Security Fence can provide anti-ram systems, anti-climb systems, Intrusion Detection Sensors and other security features.

IFigure XXX: Perimeter Steel Fence

Figure XXX: Steel Gate

Figure XXX: Security Steel Fence

2. Welded Wire Fences and Gates

Welded wire fences and gates serve the same functions as steel gates and fences, but shall only be used in edge areas.

Standard Fence and Gate / Only Edge Zones

Amopanel or Fiesta Fence & Gate
Color: Black or Silver
Ametco Manufacturing Corporation
4326 Hamann Parkway, P.O. Box 1210
Willoughby, OH 44096
Phone: 1-800-321-7042, Fax: 1-440-951-2542

As with steel fences, design specifications and fence heights of welded wire shall be determined by security needs at an individual project level. The Fiesta design provides more security than the Amopanel. Black or silver can be specified according to design intent. Chain link fencing may only be used in remote "edge" zones.

Figure XXX: Welded Wire Fence

c. Steel Bollards

Steel bollards shall be used to limit vehicular access and to separate vehicular areas from pedestrian areas.

Standard Bollards:

Annapolis Bollard
Color: Black or Silver
Landscape Forms, Inc.
431 Lawndale Avenue, Kalamazoo, MI 49048
Phone: (800) 521-2546, Fax: (269) 381-3455
Email: Specify@landscapeforms.com

Meet security requirements

If the pre-approved manufacturer is not used, an equal alternate must be:

- Steel (Material)
- Silver or Black (Color)

Figure XXX:: Standard Steel Bollard

Bollards used for security must comply with installation requirements set by Security Division. Contact S-1 for guidance.

- Bollards must be a minimum of 30 inches tall.
- The maximum spacing for bollards is 6 ft. on center.
- Provide removable bollards at secure locations needing emergency or service vehicle access.
- Bollards should be finished to compliment the surrounding architecture.
- Bollards may be integrated with plantings to enhance the visual appearance of the barrier.

d. Walls

Walls shall be used to limit access to secure or classified areas, to protect people from safety hazards and to act as visual screens.

Standard Wall Types:

Center Zone:
Security & Screening: Concrete wall
Retaining: Poured-in-place concrete

Edge Zone:
Security & Screening: Concrete wall
Retaining: Versa-Block

Coordinate wall colors with surrounding buildings and landscape

Figure XXX: Concrete with Stucco

Figure XXX: Barrier Materials

Barrier Materials								
	Limited Access		Asset Protection		Visual Screening		Safety Hazard	
	Center	Edge	Center	Edge	Center	Edge	Center	Edge
Gate, opaque					■	■		
Gate, visually open	■	■	■	■			■	■
Fabricated Structural Steel Fencing	■	■	■	■		■	■	■
Chain link fence, vinyl coated		■		■				■
Chain link fence, galvanized		■		■				■
Chain link fence, vinyl coated with vines						■		
Chain link fence, galvanized with vines						■		
Masonry wall, finish to match building	■	■	■	■	■	■	■	■
Concrete wall, finish to match building	■	■	■	■	■	■	■	■
Concrete interlocking wall units, colored	■	■	■	■			■	■
Bollard, fabricated finished steel	■	■	■	■			■	■
Bollard, steel pipe/filled concrete	–	■		■				■
Jersey Barrier, finish to match buildings	■	■		■			■	■
Specialized barriers (IDS)	As approved or required by S Division							

Walls should be designed to blend with other site improvements so that their function as barriers is camouflaged. Walls used for security must comply with requirements set by Security Division. Contact S-1 for guidance.

Guidelines

- Wall materials appropriate for security barriers include:
  – masonry walls
  – concrete walls
  – jersey barrier walls
  – concrete interlocking unit systems
- Use wall materials that compliment the adjacent building colors and finishes.
- Walls used for visual screening shall be a minimum of 6 ft.. tall.
- Security walls can incorporate planters and seating in their design-17 and IV-18). The height and size of the planters and seating will depend on security requirements.
- Retaining walls can be useful as blast barriers.

e. Jersey Barrier

Jersey Barriers shall be used to limit vehicular access and to separate vehicular areas from pedestrian areas. A local manufacturer shall always be used to reduce shipping distance and expense.

Figure XXX: Jersey Barrier

Figure XXX: Poured in Place Concrete Wall

f. Landscape Buffers and Landforms

Landforms can be used in conjunction with landscape planting to act as visual and wind screens. Use the following definitions for these more natural barriers.

Buffers

Buffer zones rely on distance to protect or screen an area. Required buffer distances are set by Security Division.

Landforms

Berms and swales are landforms that together with landscaping provide asset protection, visual screening and an attractive landscape *(Figure XXX.)* Use plants from the approved plant list.

Security buffers and landforms must comply with requirements set by Security Division.

Contact S-1 for guidance.

Figure XXX: Barrier - Bollardsz

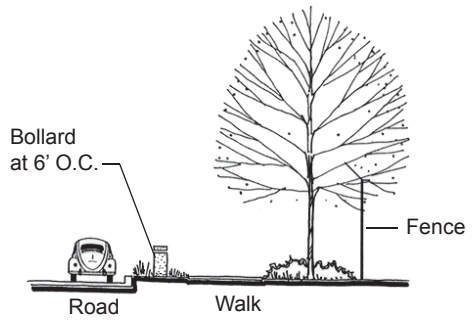


Figure XXX: Barrier - Vertical Grade Change + Fence

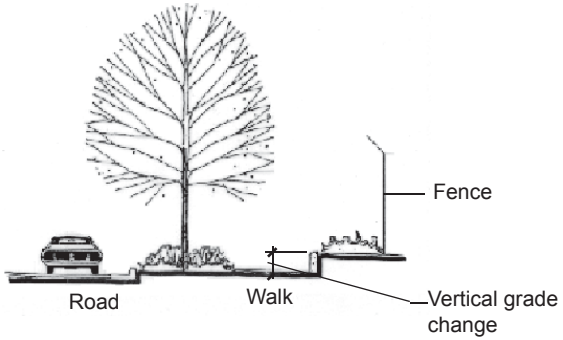


Figure XXX: Jersey Barrier

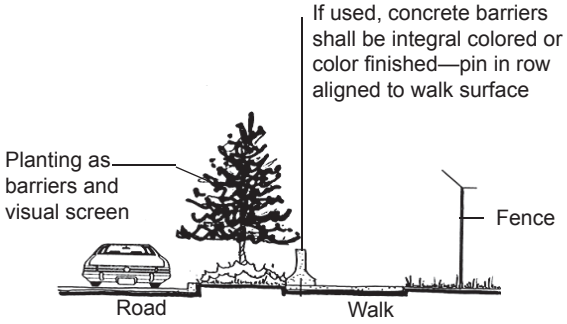


Figure XXX: Barrier - Landscaped Berm

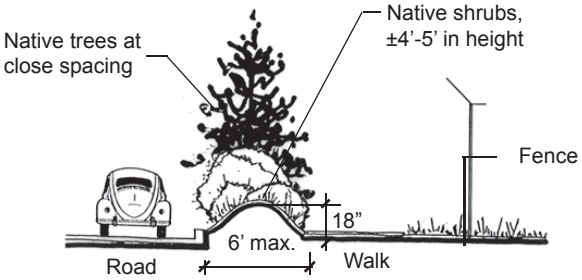


Figure XXX: Barrier - Raised Planter

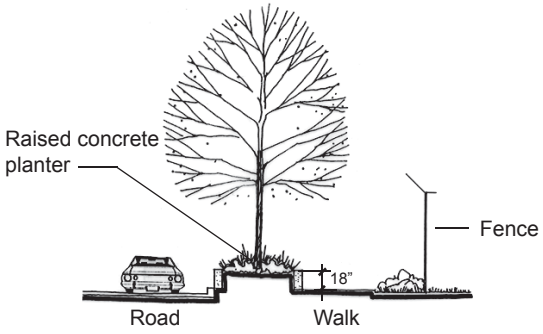
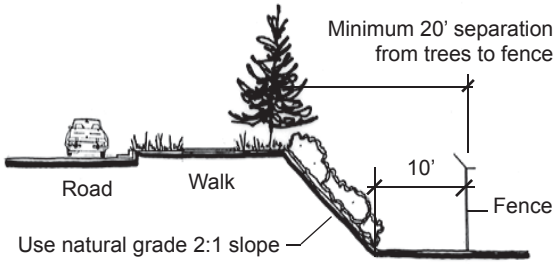


Figure XXX: Barrier - Grade Change



4. Exterior Lighting

Exterior lighting provides a sense of night time safety and security. Different areas call for different illumination levels, fixtures and heights. This section describes lighting for general areas, parking areas, pedestrian paths and security needs.

This section provides supplemental information for:

Table XXX, C.3 Landscape Element /Exterior Ligthing
- **General Areas**
- **Parking Areas**
- **Pedestrian Areas**
- **Security Lighting**

a. General Area Lighting

General Area Lighting

- For illumination levels, see Table IV-5.
- Maintain exterior lighting standards and recommended levels set by the Laboratory Engineering Manuals (LEM), IESNA Lighting Handbook, and the New Mexico Night Sky Protection Act.
- Limit light trespass to 0.5 footcandles, 10 ft.. beyond the design area boundary.
- Use pole-mounted instead of building mounted area lighting where possible.

Pole Mounted Fixtures

- Use pole-mounted fixture heights for areas as noted on Figures IV-69 and IV-70.
- Poles shall be round aluminum with a brushed or anodized finish. Poles shall be designed to withstand extreme wind loads of 80 m.p.h. with a 1.3 gust factor.
- Structurally engineer pole bases for parking areas that extend 30" above grade.

Controls

- Provide a central timer, photocell and/or motion sensor control for all exterior lighting unless specific security requirements apply.
- Provide lightning protection as required by the LEM.

Luminaires

- All exterior luminaries shall be "full cutoff" type as defined in the IESNA Lighting Handbook. Only luminaires with zero candela intensity at 90 degrees above nadir and less than 100 candela at 80 degrees above nadir are considered "full cutoff."

Figure XXX: Pole Heights

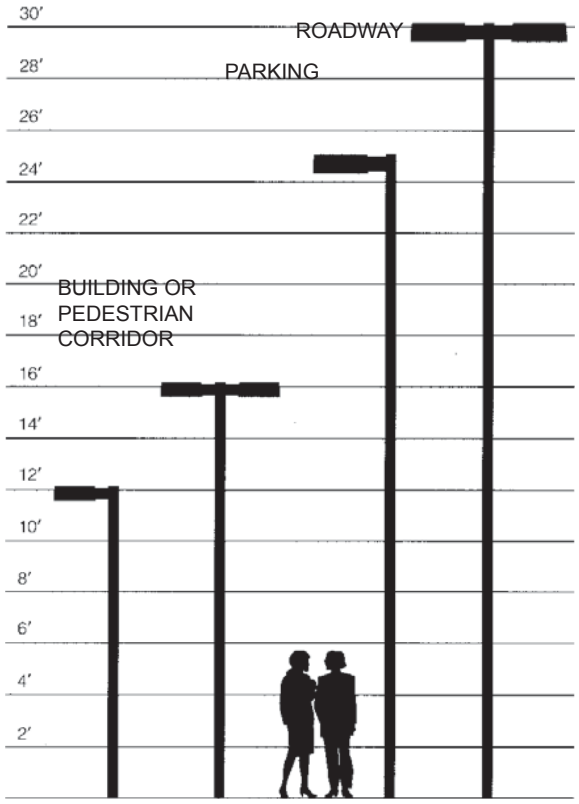
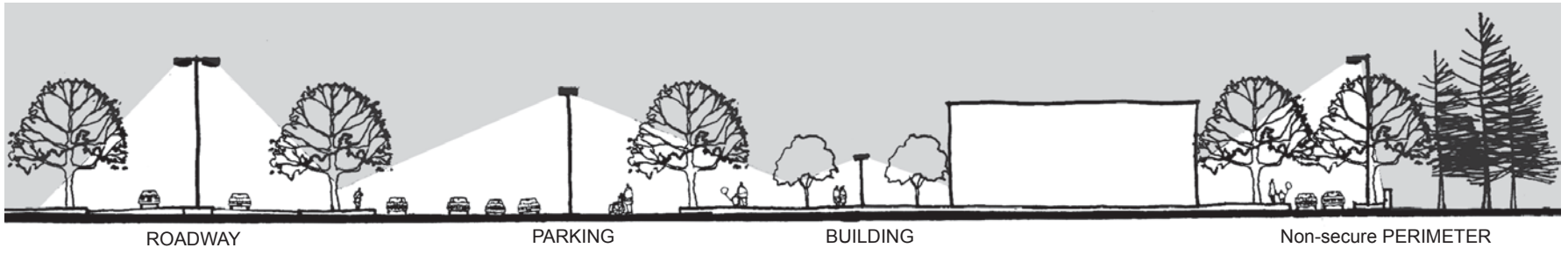


Figure XXX: Lighting Areas



Lamps

- For general site lighting, use color-corrected, high-pressure sodium lamps.
- For landscape, accent, and signage lighting use a maximum of 150 watts incandescent.
- For internally illuminated signage use fluorescent lamps with low temperature ballasts and conform to Laboratory signage standards.

Placement

- Maintain a 1 ft.. setback from paving for light fixtures in planting areas.
- Minimize planting near light poles for maintenance access.

Image IV-34: Mitre M2 General Area Lighting

Image to be updated

Table IV-5: Selected Required Luminance - IESNA Standards

Area	Luminance Average (fc)
Roadways	
Major arterial urban	0.6
Collector and transit way	0.6
Local urban	0.4
Parking Areas	0.5
Building Areas	
Entrances	5.0
Service areas	2.0
Pedestrian Areas	
Plazas	1.0
Sidewalks	
Roadside	0.2
Pedestrian Ways	0.5

Image IV-34: Mitre Series

Image to be updated

Standard General Area Fixture:

Mitre Series
Architectural Area Lighting
14249 Artesia Blvd.
La Mirada, CA 90638
phone 714.994.2700 • fax 714.994.0522
www.aal.net
Color: Silver
Height: Varies
Pole: Cast Aluminum

If the pre-approved manufacturer is not used, an equal alternate must be:

- Equivalent to lighting standards
- Silver color

b. Parking Lighting

Standard Parking Area Fixture:

Mitre Series M2P
Architectural Area Lighting
14249 Artesia Blvd.
La Mirada, CA 90638
phone 714.994.2700 • fax 714.994.0522
www.aal.net
Color: Silver
Height: Varies
Pole: Cast Aluminum

If the pre-approved manufacturer is not used, an equal alternate must be:

- Equivelent with Lighting Standards
- Silver color

Image IV-34: Mitre M1 Parking Light Fixture

Image to be updated

c. Pedestrian Lighting

Standard Pedestrian Area Fixture:

Mitre Series
Architectural Area Lighting
14249 Artesia Blvd.
La Mirada, CA 90638
phone 714.994.2700 • fax 714.994.0522
www.aal.net
Color: Silver
Height: Varies
Pole: Cast Aluminum

If the pre-approved manufacturer is not used, an equal alternate must be:

- Equivalent with Lighting Standards
- Silver color

Image IV-34: Mitre M1P Parking Light Fixture

Image to be updated

d. Security Lighting

Protective illumination shall be provided to permit detection and assessment of adversaries and to reveal unauthorized persons. Provide lighting as specified by DOE and S-1 requirements.

- Protective lighting in protected areas, material access areas, and vital areas shall be designed to provide 24-hour visual assessment.
- Lights shall provide a minimum two (2) footcandle (fc) illumination at ground level for at least a 30 ft.. diameter around protective personnel posts, and two (2) footcandle illumination for 150 ft.. in all directions.
- Where protective lighting at remote locations is not feasible, patrols and fixed post locations may be equipped with night vision devices.
- Minimize glare where it impedes effective operations of protective personnel, is adjacent to highway or is objectionable to occupants of adjacent properties.
- Light sources on protected perimeters shall be located so that illumination is directed outward wherever possible.
- If sodium vapor or other High Intensity Discharge (HID) lamps are used in isolation zones, then alternate lighting should be available in the event that power is lost and to cover the time before the HID lamps can be relighted. Both the HID lamps and the alternate lighting shall be connected to primary and standby power.

5. Pavement

There are many factors to consider when choosing paving for different applications. Strength, durability, accessibility, permeability and appearance are all important qualities of paving. This section describes the appropriate paving types at the laboratory and where to use them.

This section provides supplemental information for:

Table XXX, C.3 Landscape Element / Pavement

- **Plazas Pavement**
- **Entrances Paving**
- **Outdoor Break**
- **Sidewalks**
- **Permeable Paving**
- **Trails Paving**

Pavement creates the stable ground plane for pedestrian activities. A simpified palette of paving materials and the definition of use locations follows.

- Design pavement to accommodate emergency and fire department vehicle weights, per NFPA 1141.
- Use paving to clearly differentiate between pedestrian and vehicular areas.
- Use specialty paving to accent key pedestrian zones such as: crosswalks, primary pedestrian corridors, plazas and courtyards.
- Match all pavement repairs and patches to original paving color, and material.
- Where paving is over utility lines, use interlocking concrete pavers to allow easy access for maintenance and repairs.
- See Table XXX for appropriate paving materials for specific applications.

Figure XXX: Specialty Paving Example (Detectable Warning Paver)

a. Plazas / Entrances / Outdoor Break Areas

Pavement in plazas, entrances and outdoor break areas is intended to be functional and decorative. Accent paving materials, such as, integral colored concrete and interlocking concrete pavers are encouraged and required over utility corridors within these areas.

Requirements

See Urban Open Space section for dimensional requirements for plazas, entrances, and outdoor break areas.

Figure XXX: Specialty Plaza Paving Example (Concrete Paver)

b. Sidewalks

Pavement for sidewalks will in most cases be cast-in-place concrete. An exception is at street crossings, there accent paving to distinguish the pedestrian walking path should be installed. Sidewalks in very high visitor traffic areas may also use accent paving to highlight visitor destinations.

Requirements

Provide min. 6’ wide sidewalks site-wide

Walks leading to main entrances of destination buildings entrances shall be a minimum of 10 ft. wide or the width of the main entrance doors which ever is wider.

Figure XXX: Textured Concrete Paving Finish Patterns

c. Permeable Paving

Permeable paving may be used in vehicular and pedestrian areas where permeability needs to be maintained. In vehicular areas, traffic must be limited to approximately less than 25 cars per day over the permeable paving.

Standard Permeable Paving:

Interlocking Concrete Pavers
Pavestone Company
1015 South 42rd Street
Phoenix, AZ 85009
Phone: (602) 259-4588

Gravel Pave
Invisible Structures, Inc.
20100 E. 35th Drive, Aurora, CO 80011-8160
Phone: 800-233-1510 • Fax: 800-233-1522
www.invisiblestructures.com

Figure XXX: Installed 'Uni-ecostone' Concrete Pavers

Figure XXX: Permeable 'Uni-ecostone' Concrete Pavers

Figure XXX: Permeable 'Gravel Pave' System

d. Trail Paving

Standard Trail Paving:

Decomposed Granite, Crusher Fines,

Bark Mulch, Gravel Pave
Install min. 4' wide for accessible trails in "center" areas.

Asphalt
Install in "center" or "edge" zones.
Install over an engineered basecourse to extend the life of asphalt surface and reduce maintenance.

Bark Mulch, Stabilized Soil, or Gravel
Install in "edge" zone trails and paths where accessibility is not required.

Figure XXX: Installed 'Gravel Pave' Trail

Figure XXX: Appropriate Paving Materials

APPROPRIATE PAVING MATERIALS		PLAZAS ENTRANCES		OUTDOOR BREAK AREAS		SIDEWALKS		TRAILS	
		CENTER	EDGE	CENTER	EDGE	CENTER	EDGE	CENTER	EDGE
HARD PAVING									
Concrete	**Cast-in-place**	■	■	■	■	■	■		
	Integral Color	■	■	■	■	■			
Interlocking Concrete Pavers		■	■	■		■			
Asphaltic Paving								■	
SOFT PAVING									
Decomposed Granite								■	
Stablized Crushed Stone								■	
Gravel									■
Bark Mulch								■	■
Compacted Soil with Binder									■

Concrete

Poured-in place with nonskid finish (no exposed aggregate), with narrow expansion joints filled to the surface (Figure XXX).

Integral color concrete shall be earth tones

Interlocking Concrete Pavers

Pre-manufactured with nonskid finish, brick shape, in earth tone colors, (Figure XXX).

Soft Paving Materials

Soft granular or much paving materials should be confined at the edges with steel edging or concrete mow curbs when used in “center” zones.

6. Planting

In an arid climate, planting must respond to regional conditions with purposeful placement, appropriate plant choices and water harvesting.

This section provides supplemental information for:

Table XXX, C.3 Landscape Element / Plantings

- **Planting-Buildings**
- **Planting-Roadways**
- **Planting-Parking**
- **Planting-Reveg**
- **Mulches**
- **Water Harvesting**
- **Irrigation**
- **Plant List**
- **Revegetation Mix**

General Planting Standards

The Laboratory has a strong commitment to xeriscape principles for landscapes to reduce the demand for irrigation water and to integrate with the natural environment of Los Alamos (*Figure XXX*). The following are applicable xeriscape principles.

Minimize turf areas

Use native grasses (Image IV-48) instead of bluegrass and fescue lawns. Buffalo grass or Blue Grama Grass (Image IV-46) are suitable warm-season native grasses for use as lawn areas.

Improve the soil

- Plants will grow better and use water more effectively and efficiently.
- Rainfall will be absorbed more readilly by the soil, hereby reducing runoff and erosion, and providing supplemental water.

Soils can vary greatly over an installation or even on a job site. Use a soil analysis to determine the exact soil improvements needed. Although native plants in the region may not require soil improvements to thrive, the addition of organic soil allows better absorption of water and provides beneficial nutrients for plants.

Select water-efficient plants

Cluster plants with similar water requirements to simplify irrigation system design and maintenance needs. Create watering zones (hydrozones) based on site conditions, plant material, water needs, and microclimates. These zones align with Laboratory Engineering Standards 'Maintenance Zones.' The landscape design can be organized into three hydrozones, see Figure IV-71:

Outer Hydrozone

The outer hydrozone should be the largest planting zone. It is the natural area of the site and the edges of the developed cores. Plants chosen for this zone should be natives or very hardy plants with extremely low water requirements. Once established, these plants should require little to no irrigation and require only seasonal maintenance such as weed control and occasional pruning.

Intermediate Hydrozone

The intermediate zone is the transitional area between the inner and outer zones. Plants in this zone may require limited supplemental irrigation to augment natural precipitation. Opportunities to use runoff from paved areas or roof drains shall be utilized (Figure IV-72). Plant densities are reduced as compared to the inner zone. Overall maintenance and water use should be controlled and limited in this zone.

Figure XXX: Grass Mowing

Figure XXX: Native Blue Grama Grass As Lawn

IFigure XXX: Coyote Willow - Native Riparian Plant

Figure XXX: Native Sheep Fescue Grass

Figure XXX: Xeric Planting

Figure XXX: Wildlife Habitat Planting

Inner Hydrozone

The inner zone should be limited to high-visibility areas in terms of appearance, image, and usage. Some rural areas of the Laboratory may not have inner hydrozone landscape areas. This zone should be kept relatively small in size. This zone may have a higher water use than the other hydorozones. Water-loving plants can be used in this zone if placed where irrigation or other runoff can be collected or redirected to support the plants. Long-term maintenance of this zone is critical.

Practice Proper Maintenance

Matching the level of management to the type of plant creates healthier and easier to maintain landscapes. A well designed and established xeric landscape generally requires minimal maintenance and less fertilizer and insecticide. As xeric landscapes mature, they should be managed toward a less frequent but deep watering regiment.

Best Planting Design Practices:

- Plant design should preserve and enhance existing natural landforms and vegetation.
- Plant design should emphasize the use of native and drought-tolerant, low-maintenance plant materials.
- Plant design solutions should minimize adverse impacts on the natural habitat.
- Plant design and maintenance should reduce fertilizer and pesticide pollution by using integrated pest management techniques, recycle green waste, and minimize runoff by using water harvesting methods.
- Plant design should incorporate energy conservation and resource management concerns.

Functional Uses of Plants

1) Wind control

Plants can modify wind speed on the ground for distances up to thirty times their height (Figures IV-74 and IV-75). Dense masses of large evergreen trees planted to intercept prevailing winter and summer winds can influence the energy efficiency of facilities and increase the livability of outside spaces.

2) Temperature modification

Throughout many regions of the United States, direct radiation from the sun creates uncomfortably high temperatures during the summer season. Locating densely foliated trees and shrubs to the southwest and west of facilities can reduce heat gain. In most regions, warmth from the sun is desirable during the winter. Deciduous trees planted to the south and west of facilities will provide summer shade, while not blocking winter sun.

3) Noise abatement

Trees, shrubs, ground covers, and turf buffer noise by disguising the source of the sound and minimally reducing the sound intensity when sufficiently massed. To be truly effective in controlling noise, plants need to be used in concert with masonry walls or similar noise buffering structures.

4) Glare control

Trees, shrubs, and other vegetation can effectively reduce glare and reflection when placed between the light source and the observer.

5) Surface erosion control

Wind and water can erode valuable top soil. Plants, especially grasses, can prevent or control erosion by stabilizing the soil through their root structures. Exposed soil on cut banks and steep slopes should be immediately planted with grasses and/or native low-growing shrubs and spreading ground covers.

6) Plant Diversity

The planting philosophy of the Laboratory is to support the ecological diversity and existing natural of the site. Many species in an area automatically make that area both visually pleasing and biologically stable The diversity of successional communities enables them to survive catastrophic events such as fire. The existence of a variety of species assures greater resistance to disease and to the intrusion of alien plants. In natural areas of the Laboratory, plant selections shall incorporate a variety of plants that support the natural diversity of Los Alamos flora.

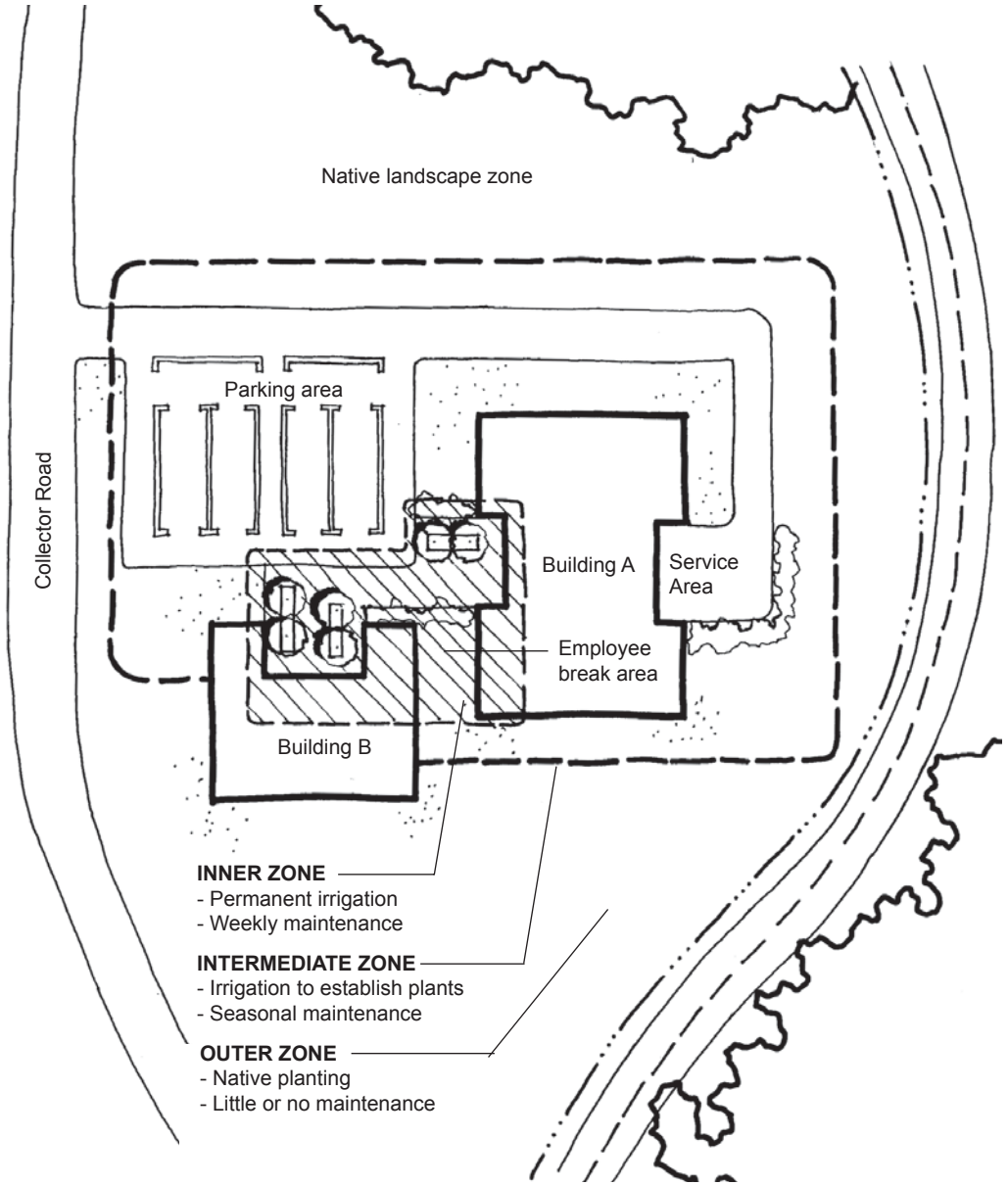
7) Wildlife Food and Cover

Plants as wildlife food and cover serve an important function in the natural environment (Image IV-50). The Laboratory encourages planting that incorporates wildlife values.

Best Practices

- The greater number the habitat junctions the greater the species diversity. Therefore, plant two or more plant communities adjacent to each other wherever possible.
- Mix fast and slow-growing plants in groups of five or more to provide larger food supplies, be more conspicuous to wildlife and insure survival of a plant species.
- Not all native plant species provide food for wildlife. Select palatable berries with an abundance of small fruits (pea size or smaller). For animals other than birds, the most attractive foods are nuts.
- Plant wildlife forage away from buildings. They are permitted along the edges of fields, lawns, roads and other open areas.
- Avoid planting fruit trees such as apricots, apples, peaches, etc. in the immediate vicinity of buildings as these tend to attract bears.

Figure XXX: Landscape Hydrozones



a. Planting Around Buildings

Minimum plantings around buildings shall include at least:

Three (3) 2" caliper trees for every 3000 sq. ft. of related building (min. one tree) , above requirements for entrances and outdoor break areas.

b. Planting for Roadways

Minimum plantings along roadways shall include at least:

The minimum as required in roadway standards, See Section XXX.

c. Planting for Parking Lots

Minimum plantings in parking lots shall include at least:

One (1) 2" caliper tree per every ten stalls with three shrubs.

d. Planting for Revegetation

Revegetation planting shall be applied in

All areas disturbed by construction activities. Use revegetation seed mix as noted in Plant List in this document.

Figure XXX: Water Harvesting Parallel Swales

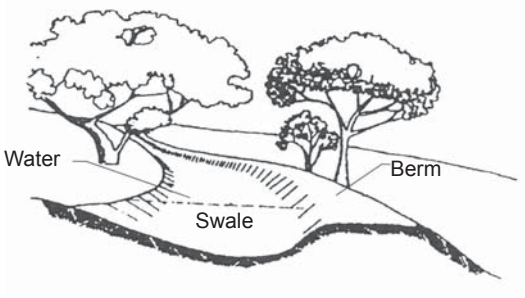


Figure XXX: Wind Mitigation Plan

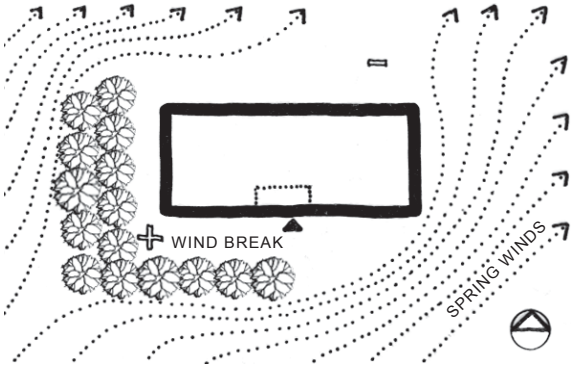
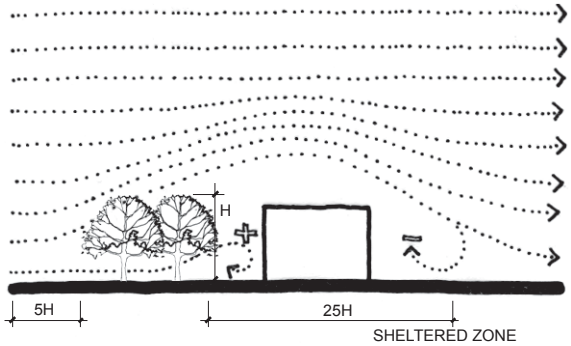


Figure XXX: Wind Mitigation Section



e. Mulches

Organic or inert mulches applied to proper depths will reduce water needs and weed growth while providing visual interest and surface erosion control. Organic mulches such as pine needles, crushed pecan shells and double shredded and finely chipped bark provide the added benefit of improving the soil through slow decomposition. Do not use pine needles in fire resistant zones. All non-native planting in developed areas of the Laboratory shall be mulched.

Mulches shall be:

3" minimum depth gravel mulch in fire-safety areas

2" pecan hull mulch in planter beds in non-fire safety areas

f. Water Harvesting

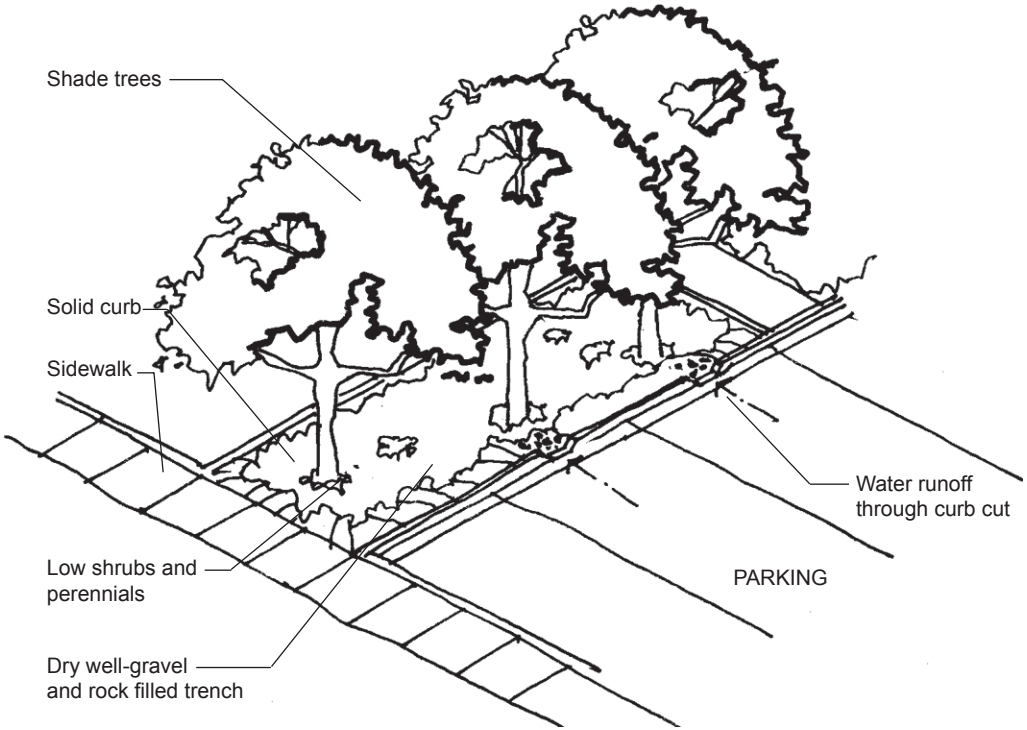
Potable drinking water is the largest source of irrigation water used at the Laboratory. To better manage that precious resource, water harvesting of rainfall is as an alternate water source that should be utilized. Rainwater harvesting collects, concentrates, and stores natural rainfall for use by plants.

There are many ways to collect or redirect rainfall runoff from roofs, paved areas (Figure IV-72), or through the manipulation of the ground plane. Water harvesting methods for rainwater include:

- Parallel swales (Figure IV-73)
- Terraced grading
- Cisterns
- Rain gardens
- Gravel grid gardens
- Hay bale swales
- Dry sumps
- French drains

Water harvesting using a combination of collection methods shall be used where building and/or parking run-off can be collected.

Figure XXX: Parking Lot Water Harvesting Swale



g. Irrigation

Irrigation water is being drawn from the same finite resource that supplies the larger community; thus, the Laboratory has a strong commitment towards water conservation.

Irrigating xeriscape plants slowly, deeply, and infrequently is the most desired irrigation pattern. Designing irrigation systems using drip emitters, low volume spray heads, matched precipitation heads, flow meters, controllers with rainfall sensors, and automated systems are a few of the many ways that irrigation can reduce water demand.

Irrigation shall be:

A permanent automated system that is a low flow irrigation design with a moisture sensor connected to a centralized controller system.

Best Practices/Irrigation Design

- Avoid oddly shaped or steeply graded planting areas, which are difficult to irrigate and maintain efficiently.
- Design landscaping plans in conjunction with irrigation systems to recognize differing water requirements of various plants.
- Select low to moderate water use plants for growth and survival.
- Minimize turf areas.
- Investigate water-absorbing soil additives and conduct experiments in the field to determine success and cost effectiveness before modifying standard installation landscape construction specifications and details.
- Design irrigation systems using low-flow, low-volume automated systems wherever possible.

7. Plant List

This list is a list of plants approved for use at Los Alamos National Laboratory. It is not a list of all plants that grow in the local area.		**Mature Height**				**Flower**			**Shade/Sun**			**Moisture**					**Seasonal Interest**					**Use**	
		10' - 15'	*15' - 20"*	*20' - 30'*	*30' +*	*Spring*	*Summer*	*Fall*	*Full Shade*	*Part Shade*	*Full Sun*	*Dry*	*Average*	*Moist*	**Native**	**Drought Tolerant**	*Flowers*	*Fruit*	*Full Color*			**Urban**	**Rural**
Botanic Name	***Common Name***																						
TREES																							
Abies concolor	White Fir				♣						♣		♣	♣	♣	♣						♣	
Pinus nigra	Austrian Pine				♣						♣	♣			♣	♣						♣	♣
Acer ginnala	Amur Maple	♣									♣		♣			♣			♣			♣	
Acer glabrum	Rocky Mountain Maple	♣									♣		♣		♣	♣		♣	♣			♣	
Acer s. grandidentatum	Western Sugar (Bigtooth) Maple			♣							♣		♣		♣	♣			♣			♣	
Celtis occidentalis	Common Hackberry			♣		♣					♣	♣	♣		♣	♣		♣				♣	♣
Crataegus crusgalli var. inermis	Thornless Cockspur Hawthorn			♣		♣					♣		♣			♣		♣				♣	♣
Juniperus scopulorum	Rocky Mountain Juniper	♣									♣	♣			♣	♣		♣					♣
Juniperus monosperma	One-seed Juniper	♣									♣	♣			♣	♣		♣					♣
Pinus edulis	Pinon Pine	♣									♣	♣	♣		♣	♣	♣					♣	♣
Pinus flexilis	Limber Pine				♣					♣	♣	♣	♣		♣	♣							
Populus tremuloides	Quaking Aspen		♣								♣		♣	♣	♣				♣				
Quercus gambelii	Gambel Oak			♣						♣	♣	♣	♣		♣	♣							
Fraxinus pennsylvanica	Green Ash			♣							♣		♣						♣			♣	
Platanus occidentalis	American Planetree				♣						♣		♣									♣	
Gleditsia triacanthos var. inermis	Thornless Honeylocust			♣							♣		♣									♣	
Malus spp.	Crabapple	♣				♣					♣		♣				♣					♣	
Pyrus spp.	Ornamental Pear	♣				♣					♣		♣			♣	♣					♣	

Botanic Name	Common Name	Mature Height				Flower			Shade/Sun			Moisture					Groth Rate					Use	
		Under 12”	*1’ to 3’*	*3’ to 6’*	*Over 6’*	*Spring*	*Summer*	*Fall*	*Full Shade*	*Part Shade*	*Full Sun*	*Dry*	*Average*	*Moist*	**Native**	**Drought Tolerant**	*Erosion Control*	*Screening*	*Slow*	*Moderate*	*Rapid*	**Urban**	**Rural**
SHRUBS																							
Artemesia tridentata	Big Sagebrush			✤							✤	✤			✤	✤	✤				✤		✤
Atriplex canescens	Four-Wing Saltbush			✤							✤	✤			✤	✤	✤				✤		✤
Caragana arborescens	Siberian Peashrub				✤	✤				✤		✤	✤		✤	✤		✤			✤		✤
Caryopteris x. clanodnensis	Blue-mist Shrub				✤			✤				✤	✤	✤									
Chaenomeles speciosa	Common Floweringquince		✤	✤		✤				✤	✤	✤	✤			✤				✤		✤	
Chamaebatiaria millefolium	Fernbush			✤		✤				✤	✤	✤			✤	✤		✤			✤	✤	✤
Chrysothamnus nauseosus	Rubber Rabbitbrush			✤				✤			✤	✤			✤	✤	✤				✤		✤
Cotoneaster divaricatus	Spreading Cotoneaster			✤		✤				✤	✤		✤				✤			✤	✤	✤	
Cowania mexicana	Cliffrose			✤			✤				✤	✤			✤	✤			✤			✤	✤
Cercocarpus ledifolius	Curl-leaf Mountain Mahogany			✤							✤	✤			✤	✤		✤	✤			✤	✤
Cercocarpus intricatus	Littleleaf Mountain Mahogany			✤						✤	✤	✤			✤	✤		✤	✤			✤	✤
Cercocarpus montanus	Mountain Mahogany			✤						✤	✤	✤			✤	✤		✤	✤				✤
Cornus sericea ‘Isanti’	Isanti Redosier Dogwood			✤			✤		✤	✤			✤	✤							✤	✤	
Elaeagnus commutata	Silverberry				✤	✤					✤	✤	✤		✤	✤		✤			✤	✤	✤
Fallugia paradoxa	Apache Plume				✤		✤				✤	✤			✤	✤	✤				✤	✤	✤
Foresteria neomexicana	New Mexico Olive				✤	✤				✤	✤	✤	✤		✤	✤		✤			✤	✤	
Forsythia ‘Arnold Dwarf’	Arnold Dwarf Forsythia			✤		✤				✤	✤	✤	✤				✤				✤	✤	
Forsythia ‘Northern Sun’	Northern Sun Forsythia				✤	✤				✤	✤	✤	✤				✤				✤	✤	

Botanic Name	Common Name	Mature Height				Flower			Shade/Sun			Moisture					Groth Rate					Use	
		Under 12”	*1’ to 3’*	*3’ to 6’*	*Over 6’*	*Spring*	*Summer*	*Fall*	*Full Shade*	*Part Shade*	*Full Sun*	*Dry*	*Average*	*Moist*	**Native**	**Drought Tolerant**	*Erosion Control*	*Screening*	*Slow*	*Moderate*	*Rapid*	**Urban**	**Rural**
SHRUBS CONTINUED....																							
Juniperus spp.	Juniper Species			♣						♣	♣	♣	♣				♣			♣		♣	
Juniperus communis	Common Juniper		♣						♣	♣		♣	♣		♣	♣	♣			♣			♣
Lonicera involucrata	Twinberry			♣			♣		♣	♣		♣	♣			♣				♣		♣	
Lonicera spp.	Honeysuckle Species				♣	♣	♣			♣	♣		♣							♣		♣	♣
Mahonia aquifolium ‘Compactum’	Compact Oregon Grape			♣		♣				♣			♣						♣			♣	
Mahonia repens	Creeping Mahonia		♣			♣				♣			♣						♣			♣	
Perovskia atriplicifolia	Russian Sage		♣				♣				♣	♣				♣							
Pinus mugo	Mugo Pine and Varieties		♣	♣	♣				♣	♣	♣		♣	♣				♣	♣			♣	♣
Potentilla fruticosa ‘Gold Drops’	Gold Drop Bush Cinquefoil		♣				♣				♣	♣	♣			♣				♣		♣	♣
Potentilla fruticosa ‘Klondike’	Klondike Bush Cinquefoil		♣				♣				♣	♣	♣			♣				♣		♣	♣
Potentilla fruticosa ‘Katherine Dykes’	Katherine Dykes Bush Cinquefoil		♣				♣				♣	♣	♣			♣				♣		♣	♣
Prunus americana	American Plum				♣	♣					♣	♣	♣		♣	♣					♣	♣	♣
Prunus besseyi	Western Sand Cherry			♣		♣					♣	♣	♣		♣	♣				♣		♣	♣
Prunus virginiana melanocarpa	Common Chokecherry				♣	♣				♣	♣		♣			♣				♣		♣	♣
Ribes alpinum ‘Aureum’	Yellow-leaved Alpine Currant			♣		♣				♣	♣	♣	♣							♣		♣	♣
Ribes alpinum ‘Cereum’	Squaw Currant			♣		♣					♣	♣								♣		♣	
Ribes inermis	Whitestem Gooseberry			♣		♣			♣	♣	♣	♣	♣		♣					♣		♣	
Rosa foetida	Austrian Copper Rose				♣	♣					♣	♣	♣			♣					♣	♣	

Botanic Name	Common Name	Mature Height				Flower			Shade/Sun			Moisture					Groth Rate					Use	
		Under 12”	*1’ to 3’*	*3’ to 6’*	*Over 6’*	*Spring*	*Summer*	*Fall*	*Full Shade*	*Part Shade*	*Full Sun*	*Dry*	*Average*	*Moist*	**Native**	**Drought Tolerant**	*Erosion Control*	*Screening*	*Slow*	*Moderate*	*Rapid*	**Urban**	**Rural**
SHRUBS																							
Artemesia tridentata	Big Sagebrush			✤							✤	✤			✤	✤	✤				✤		✤
Atriplex canescens	Four-Wing Saltbush			✤							✤	✤			✤	✤	✤				✤		✤
Caragana arborescens	Siberian Peashrub				✤	✤				✤		✤	✤		✤	✤		✤			✤		✤
Caryopteris x. clanodnensis	Blue-mist Shrub				✤			✤				✤	✤	✤									
Chaenomeles speciosa	Common Floweringquince		✤	✤		✤				✤	✤	✤	✤			✤				✤		✤	
Chamaebatiaria millefolium	Fernbush			✤		✤				✤	✤	✤			✤	✤		✤			✤	✤	✤
Chrysothamnus nauseosus	Rubber Rabbitbrush			✤				✤			✤	✤			✤	✤	✤				✤		✤
Cotoneaster divaricatus	Spreading Cotoneaster			✤		✤				✤	✤		✤				✤			✤	✤	✤	
Cowania mexicana	Cliffrose			✤			✤				✤	✤			✤	✤			✤			✤	✤
Cercocarpus ledifolius	Curl-leaf Mountain Mahogany			✤							✤	✤			✤	✤		✤	✤			✤	✤
Cercocarpus intricatus	Littleleaf Mountain Mahogany			✤						✤	✤	✤			✤	✤		✤	✤			✤	✤
Cercocarpus montanus	Mountain Mahogany			✤						✤	✤	✤			✤	✤		✤	✤				✤
Cornus sericea ‘Isanti’	Isanti Redosier Dogwood			✤			✤		✤	✤			✤	✤							✤	✤	
Elaeagnus commutata	Silverberry				✤	✤					✤	✤	✤		✤	✤		✤			✤	✤	✤
Fallugia paradoxa	Apache Plume				✤		✤				✤	✤			✤	✤	✤				✤	✤	✤
Foresteria neomexicana	New Mexico Olive				✤	✤				✤	✤	✤	✤		✤	✤		✤			✤	✤	
Forsythia ‘Arnold Dwarf’	Arnold Dwarf Forsythia			✤		✤				✤	✤	✤	✤				✤				✤	✤	
Forsythia ‘Northern Sun’	Northern Sun Forsythia				✤	✤				✤	✤	✤	✤				✤				✤	✤	

PLANTING

Botanic Name	Common Name	Mature Height				Flower			Shade/Sun			Moisture					Groth Rate					Use	
		Under 12”	*1’ to 3’*	*3’ to 6’*	*Over 6’*	*Spring*	*Summer*	*Fall*	*Full Shade*	*Part Shade*	*Full Sun*	*Dry*	*Average*	*Moist*	**Native**	**Drought Tolerant**	*Erosion Control*	*Screening*	*Slow*	*Moderate*	*Rapid*	**Urban**	**Rural**
SHRUBS CONTINUED....																							
Juniperus spp.	Juniper Species			♣						♣	♣	♣	♣				♣			♣		♣	
Juniperus communis	Common Juniper		♣						♣	♣		♣	♣		♣	♣	♣			♣			♣
Lonicera involucrata	Twinberry			♣			♣		♣	♣		♣	♣			♣				♣		♣	
Lonicera spp.	Honeysuckle Species				♣	♣	♣			♣	♣		♣							♣		♣	♣
Mahonia aquifolium ‘Compactum’	Compact Oregon Grape			♣		♣				♣			♣						♣			♣	
Mahonia repens	Creeping Mahonia		♣			♣				♣			♣						♣			♣	
Perovskia atriplicifolia	Russian Sage		♣				♣				♣	♣				♣							
Pinus mugo	Mugo Pine and Varieties		♣	♣	♣				♣	♣	♣		♣	♣				♣	♣			♣	♣
Potentilla fruticosa ‘Gold Drops’	Gold Drop Bush Cinquefoil		♣				♣				♣	♣	♣			♣				♣		♣	♣
Potentilla fruticosa ‘Klondike’	Klondike Bush Cinquefoil		♣				♣				♣	♣	♣			♣				♣		♣	♣
Potentilla fruticosa ‘Katherine Dykes’	Katherine Dykes Bush Cinquefoil		♣				♣				♣	♣	♣			♣				♣		♣	♣
Prunus americana	American Plum				♣	♣					♣	♣	♣		♣	♣					♣	♣	♣
Prunus besseyi	Western Sand Cherry			♣		♣					♣	♣	♣		♣	♣				♣		♣	♣
Prunus virginiana melanocarpa	Common Chokecherry				♣	♣				♣	♣		♣			♣				♣		♣	♣
Ribes alpinum ‘Aureum’	Yellow-leaved Alpine Currant			♣		♣				♣	♣	♣	♣							♣		♣	♣
Ribes alpinum ‘Cereum’	Squaw Currant			♣		♣					♣	♣								♣		♣	
Ribes inermis	Whitestem Gooseberry			♣		♣			♣	♣	♣	♣	♣		♣					♣		♣	
Rosa foetida	Austrian Copper Rose				♣	♣					♣	♣	♣			♣					♣	♣	

Botanic Name	Common Name	Percentage PLS Per Pound Sunny Location	Total Seeds per Pound Shady Location
Native Grass Pure Live Seed Rates			
Bouteloua gracilis	Blue Grama Grass	40 - 45%	825,000
Bouteloua curtipendula	Sideoats Grama	65 - 75%	191,000
Agropyron desertorum	Crested Wheatgrass	70 -80%	200,000
Schizachyrium scoparium	Little Bluestem	50 - 60%	379,000
Muhlengergia wrightii	Spike Muhly	55 - 60%	1,635,000
Hilaria jamesii	Galleta	30 - 40%	159,000
Oryzopsis hymenoides	Indian Rice Grass	65 - 75%	235,000
Agropyron smithii	Western Wheatgrass	75 - 85%	110,000
Buchloe dactyloides	Buffalo Grass	70 - 80%	56,000
Festuca arizonica	Arizona Fescue	70 -80%	550,000
Festuca ovina	Sheep Fescue	80 -90%	
Festuca thurberi	Thurber Fescue		
Festuca rubra var. rubra	Creeping Red Fescue	75 - 85%	615,000
Agropyron dasystachyum	Streambank Wheatgrass	80 - 90%	170,000
Recommended Seed Rate Per Foot:			
Average	70 - 75 seeds per foot		
Severe Sites	80 - 90 seeds per foot		